JUSTIFICATION FOR LOCATING PROJECT IN FOREST AREA/PROTECTED AREA

Bagramore - Panki ("Project Road") situated at northwestern part of Jharkhand and is a section of PMGSY and MDR, having total length of 46.60 Kilometer. The proposed project is essentially a state highway upgrading project and involves conversion of existing single / intermediate road to 2-lane road from km. 0.00 to km. 46.600 of Bagramore to Panki (Project Road). The total project highway falls under Chhtra and Medninagar (old Palamu) Districts in the State of Jharkhand.
Proposal divide in three part

Section	**Division**	**Forest Area Proposed for Diversion**	
1	1st section of Project road fall in Chatra south forest division from km 0/000 to 8/200	4.7071ha.	Road Construction Division Chatra
2	2nd section of project road fall in Lawalong wildlife sanctuary(Hazaribagh Wildlife Division) from km 8/200 to 34/700	20.695 ha.	Road Construction Division Chatra
3	3rd section fall in Medininnagar Forest division (Km 34/700 to 46/600)	1.5225 ha.	Road Construction Division Medininagar

This wildlife Clearance proposal is for the section from km 8/200 to Km 34/700 falling in the wildlife division Hazaribagh and to get NOC for the section 1 & 3 passing through the 10 km radius of the sanctuary area. The widening will be carried out in the 12 m width on the existing alignment only and there is no other suitable alternative land to widen the proposed road.
Reserved/Protected area diversion is proposed to meet the minimum requirement of the geometric design parameters & safety aspects of highways. Efforts have been made to keep the acquisition of forest land to its barest minimum requirement for the project.

PART A

COST BENIFIT ANALYSIS

PROJECT NAME :IMPROVEMENT AND UP-GRADATION OF EXISTING SINGLE LANE/ INTERMEDIATE LANE TO 2-LANE CONFIGURATION OF BAGRAMORE TO PANKI ROAD FROM KM 0/000 TO KM 46/600 IN CHHTRA AND MEDNINAGAR (OLD PALAMU) DISTRICTS IN THE STATE OF JHARKHAND.

PARAMETERS FOR EVALUATION OF LOSS OF FORESTS

Sr. No.	Parameter	Description
1	2	3
1	Loss of value of timber, fuel wood & minor forest produce on annual basis, including loss of man hours per annum of people who diverted livelihood and wages from the harvest of their commodities	Total no. of trees likely to be affected along the road side (within wildlife area) : 621 trees *Cost of per tree (assumed as) is Rs. 1200 per tree Therefore the total cost of road side forest that will be affected due to proposed widening of road is : Rs.7.452 lakhs
2	Loss of animal husbandry productivity including loss of fodder	Nil
3	Cost of human resettlement	Nil
4	Loss of public facilities and administration infrastructures (roads, building, schools, dispensaries, electric line, railways etc) on forest land of which would require forest land if these facilities were diverted due to the project	Nil
5	Environmental to soil erosion, effect on hydrological cycle wild life habitat micro climate upsetting of ecological balance	One hectare of fully stocked forest (density1.0) would be taken as Rs.126.74 Lakhs* to accrue over a period of 50 years. Considering the density of forest area as 0.2, the cost of environmental losses will be 126.47*0.2*20.695=523.4935 lakhs for 50 years. Therefore the cost of environmental losses per year is Rs. 10.46919 lakhs
6	Suffering of outages	N.A.

***** THE NO. OF TREE IS AS PER THE SURVEY CARRIED OUT WITH THE FOREST DEPARTMENT AND THE COST OF TREE HAS BEEN ASSUMED BASED ON THE PREVIOUS PROJECTS HOWEVER COST WILL BE UPDATED AFTER RECEIVING TREE CUTTING ESTIMATE WITH THE FOREST DEPARTMENT

THEREFORE NET LOSS: RS. 17.92119 lakhs

PART B
COST BENIFIT ANALYSIS

PARAMETERS FOR EVALUATION OF BENEFIT, NOTWITHSTANDING LOSS OF FORESTS

Sr. No	Parameters	Roads, Transmission lines & Railway lines
1.	Increase in productivity attributable to the specific project	In lieu of total trees to be affected in forest land, it is proposed to undertake compensatory afforestation as per Forest (Conservation) Act. Cost of plantation considering: 9.20 lakhs per ha.: 190.394 lakhs
2.	Benefits to economy	As described in the Economical Analysis. Part C
3.	No. of population benefited.	Deoghar district, entire Jharkhand State
4.	Employment potential	The proposed project will generate employment opportunities for the local people during the construction as well as operational phase. The construction will require approximately 200 to 250 full time workers / operators for a period of about 18 months. In addition, future induced development of the area would result in industrialization of the region and would generate more opportunities of employment for the people of the region.
5.	Cost of acquisition of facility on non-forest land wherever feasible	Total land acquisition other than forest land is 5.0134 ha. Cost of land acquisition other than forest: Rs. 50.134 lakhs
6.	Loss of (a) agriculture & (b) animal husbandry production due to diversion of forest land	Nil
7.	Cost of rehabilitating the displaced persons as different from compensatory amounts given for displacement	Nil As there are no displaced persons involved
8.	Cost of supply of free fuel-wood to workers residing in or near forest area during the period of construction.	Nil As no free fuel wood will be given to the workers during construction

Therefore Net Benefit: Rs. 190.934 lakhs

Benefit Cost Ratio=Net Benefit/Net Loss = 190.934/17.92119 = 10.63
Considering the tangible benefits, the project is found to be viable. If it considered the intangible benefits also, then the project become even more viable and attractive.

PART C

1.0 Economic Analysis

An infrastructure project is subjected to economic appraisal to ensure that the investment proposed would yield appropriate return to the national economy. It is therefore important that decisions about investments in roads are made on objective judgments and therefore, Economic appraisal has been carried out for each traffic homogenous section of entire Project road.

The basic purpose of the economic analysis is to enable the decision-makers in the Government to decide whether the project is worthy of investment keeping in view the benefits to the society. The Proposal for project road i.e Bagramore to Panki road is upgrading the road with 2 Lanes with earthen shoulders as per Traffic requirements. In order to assess the benefits accrued to the society, both the options of 'with project' and 'without project' have to be compared. For this purpose, the entire existing Road has been considered along with its proposed maintenance and improvement proposals.

1.1 Economic Analysis Approach

The economic evaluation has been carried out within the broad framework of social cost benefit analysis. The objective is to determine the best improvement scheme out of several proposals, which will lead to minimizing total transport costs and maximizing benefits to the road users.

The benefits accruing to society from the proposed improvement are mainly reduced vehicle operating cost, reduced travel time cost and reduced accident costs. Total transport costs comprise of two basic components as shown in **Table 11.1**.

Table 11.1 : Total Transport Costs

Road Supplier Costs	Road User Costs
Construction Costs	Vehicle Operating Costs (VOC) both MT & NMT
Maintenance Costs	Travel Time Costs
Replacement Costs: Costs of Environmental Impact Mitigation Measures, Costs of Rehabilitation and Resettlement (R&R) measures	

These costs are generated using HDM – IV for every year of the analysis period (cost-benefit stream) from which economic indicator parameters that essential for viability of project namely Net Present Value (NPV), Economic Rate of Return (EIRR) and Benefit Cost Ratio (B/C) are the final economic outputs.

NPV is the present value of Net Benefits (NB) during the project period. EIRR is the discount rate at which the NPV of the Net Benefit (NB) is zero. Net Benefit is the cumulative sum of the difference between yearly benefit and yearly costs incurred after discounting.

$$NB = \sum_{n=1}^{M} (Benefit(n) - Cost(n))$$

Savings from vehicle emission reduction and less energy consumption due to improved facility are also important economic savings which are possible to calculate but these quantities are not converted to economic cost inside the software. So these benefits are not included.

The appraisal period (including the construction period) has been taken as 30 years after which a residual value of investment is assumed as 5%.

1.2 Project Economic Evaluation using HDM - 4

Economic evaluation for Bagramore to Panki road is carried out by consideration of two alternatives In HDM – 4.

1.2.1 Alternative 1: Without Project

For without project consideration, project road will carry existing traffic on it without any improvement and maintenance in present condition that means No treatment is given to existing road for improving its capacity augmentation, functional and structural pavement quality and geometry standards.

1.2.2 Alternative 2: With Project

For with project consideration, Project road is rehabilitated and upgraded as 2 lanes with earthen shoulders which also incorporate 4 lane improvements at built-up locations. In this alternative, project road improvements are made by improving its geometry through realignments, providing bypasses and rehabilitation to existing pavement though reconstruction and strengthening.

1.3 Project Cost and Scheduling

The project road is 46.6 km long and passes through Bagramore, Lathaiya, Sandha & Panki. Therefore, Project road is proposed to undertake work of strengthening, rehabilitation and construction of bypasses to facilitate the existing road. The Project road is divided into 1 homogeneous section based on the Pavement improvements and homogeneous traffic sections. Accordingly, economic analysis of the project road is being carried out in single homogeneous section as follows:

Table 11.2 : Section Details

Homogeneous Section	Existing Chainage		Design Chainage		Improvement
	From	To	From	To	
Bagramore to Panki	0/000	46/600	0+000	46+125	2 lane ESS

The project road with existing carriageway width of 5.5m is proposed for 2 lanes earthen shoulders facility which satisfies the project and traffic requirement.

The Economic analysis was carried out for 30 year benefit period (2014-2044). For performing economic evaluation, a ‘project’ is formulated in which comparison is made between two scenarios namely (1) Do Nothing Scenario and (2) With Improvements.

1.3.1 Capital Cost

Project costs have been worked out and given in Chapter-10. For economic evaluation base costs have been taken as factor cost of civil works and other cost related to land acquisition social environmental and utility relocations that mean Capital cost is the total constrction cost of civil works for the project improvement.

The construction cost for each homogeneous section is tabulated in **Table 11.3** for the year 2014 at which Project will start to implement. Therefore, the project cost of present year is increased with 5 % inflation rate for two successive years. The construction cost of project will be utilised in two phases i.e. 60 % in first year and 40 % in second year as construction period of 2 years.

The cost estimate for each section has been calculated separately based on the quantities worked out for major items of work to be executed in the project on the basis of preliminary engineering design of roads, structures and the adopted rates. A conversion factor of 0.80 has been used to convert financial cost into economic costs.

The economic cost for the project is as under:

Table 11.3 : Total Project Cost

Homogeneous Section	Financial Cost Per km	Economical Cost per km
Bagramore To Panki	Rs 38886710	Rs. 31109368

1.3.2 Maintenance Cost

For Two lanes with Earthen shoulder road

Routine maintenance cost - Rs. 1.0 lac per km per year
Periodic maintenance cost - Rs 1180000 per km (25 mm SDBC)

1.4 Project Benefits

Project Benefits mainly occurs due to Reduction in Vehicle operating cost and travel time savings.

The vehicle operating cost (VOC) components are

- Fuel
- Lubricants
- Tyres
- Spare Parts
- Maintenance Labour
- Wages of Crew
- Fixed costs including overheads, administration, interest on borrowed capital
- Depreciations
- Travel time cost

1.4.1 Vehicle Fleet

1.4.1.1 Fleet Utilization

Fleet utilization data adopted for the analysis is based on the findings of Road User Cost study in 2001, IRC SP: 30-2009. The adopted values are summarized as shown in table below.

Table 11.4 : Life Norms for Vehicles

Particulars	Km Driven	Life, Year	Working Hour	Passenger
2 Axle Truck	90000	12	1950	-
Multi Axle Truck	75000	12	2100	-
3 Axle Truck	75000	12	2100	-
LCV	45500	10	1050	-
Utility Car	45500	10	1500	-
Bus/Mini Bus	125000	10	2400	45
Car / Jeep / Van	87500	10	1750	5
Two Wheeler	28800	10	636	1.5

1.4.2 Vehicle Resources

1.4.2.1 Vehicle and Tyre Cost

Economic costs of vehicle and tyre are derived from the market survey in Jharkhand. Ex-Show Room Price for each category of vehicle have been collected and elements of taxes, duties, freight, dealer's margin and incentives as applicable have been removed to arrive at the economic costs. The adopted economic costs are summarized as presented in table below.

Table 11.5 : Prices of Vehicles

Category	Vehicle(Rs.)	Tyre(Rs.)
2 Axle Truck	900000	7075
3 Axle and Multi Axle Truck	1000000	7075
LCV	500000	3500
Utility Car	600000	2250
Bus	850000	7500
Car / Jeep / Van	450000	2250
Two Wheeler	41000	750

1.4.2.2 Fuel & Lubricant

Economic Prices fuel and lubricant are arrived based on ratio of WPI for all commodities of July 2013 with respected to March 2009 and applying that ratio to search out actual value**.**

Table 11.6 : Economic Cost of Fuel & Lubricants

Item	Price/ litre as per SP 30:2009	WPI Ratio	Present Cost/ litre
Petrol	18.55	1.420	26.341
Diesel	18.20	1.420	25.844
Lubricants	56.70	1.420	80.514

1.4.2.3 Maintenance Labour and Crew Wages

Adopted values for Maintenance Labour and Crew Wages are based on the enquiries made by the Consultant with transport operators and workshops in and around the project Road. The adopted values are summarized vide in table below.

Table 11.7 : Labour and Crew Wages

(Cost in Rs. per hour)

Category	Maint. Labour	Crew Wage
Truck	100	75
3 Axle and Multi Axle Truck	100	90
LCV	100	45
Utility Car	40	25
Bus	125	115
Car / Jeep / Van	60	25
Two Wheeler	40	-

1.4.2.4 Annual Overhead

Recommendations of the "Study for Updating Road User Cost Data: 2001"and , IRC SP: 30-2009 are considered to arrive at annual overhead cost per vehicle and are summarised in table below:

Table 11.8 : Annual Overheads

Category	Annual Overhead Cost (Rs.)
2 Axle Truck	192500
3 Axle and Multi Axle Truck	258000
LCV	128000
Utility Car	110000
Bus	155000
Car / Jeep / Van	80000
Two Wheeler	6624

1.4.2.5 Annual Interest

An Economic Interest Rate of 12% has been adopted for the analysis.

1.4.2.6 Time Value of Passengers

Time Value of Passenger (Work Trips and Non Work Trips) is arrived based on "Manual of Economic evaluation of Highway Projects in India ("IRC SP:30 -2009)". The values of 2009 are upgraded by considering Whole Sale Price Index Ratio for the year 2009 and 2013. Non work time value of passenger is considered 15% and work time value of passenger is considered 85 % of time value of passengers as suggested in IRC SP:30 -2009 ". The adopted values are summarized as given in table below.

Table 11.9 : Time Value of Passengers

Mode of Travel	Unit	2 Wheeler	Car/ Taxi	Bus
Travel time Value RUCS-March 2009	Rs/Hour	32.0	62.5	39.5
WPI Ratio 2013/ 2009	-	1.420	1.420	1.420
Travel time Value RUCS-July 2013	Rs/Hour	45.44	88.75	56.09
Eq. Non-work Time Value in 2013	Rs./Hour	5.5	10.8	6.8

1.4.2.7 Time Value of Cargo

Average value of commodity is based on “Manual of Economic evaluation of Highway Projects in India (”IRC SP: 30 - 2009)”. Equivalent cost of commodity in 2013 is determined using the WPI ratio (1.420 over 2009). Average payload for each category of freight vehicles is based on axle load survey. Time-delay cost is estimated with an economic interest rate of 12% and economic conversion factor of 0.90 and provided in table below:

Table 11.10 : Time Value of Cargo

Vehicle Category	Average Payload (Tonnes)	Average Running Time (hour/Year)	Time-delay Cost (Rs./Hr)
2Axle Truck	15	1950	32.00
3 Axle and Multi Axle Truck	17	2100	55.00
LCV	8.25	1050	19.0

1.4.3 HDM Traffic

Following category of fast moving and slow moving vehicles are considered for carrying out HDM 4 Analysis.

- 2 Axle Truck
- 3 Axle Truck
- Multi Axle Truck
- LCV
- Utility Car
- Bus
- Mini Bus
- Car / Jeep / Van
- Two Wheeler

As HDM-4 does not include 3 Wheeler and Agricultural Tractor Categories of Vehicle therefore these categories are not considered in the analysis. Percentage compositions of assigned traffic in AADT on the project road as on year 2014 and adopted for the analysis for the Project road are summarized as given in table below.

Table 11.11 : Composition of Motorized Traffic assigned on Project road (MT) (%)

Section ID	2 Wheeler	Passenger Car+Jeep	Tata Ace	Bus	LCV	2-Axle	3-Axle and Multi Axle	AADT (Nos.)
CJ-1	69.5	8.6	1.8	2.1	1.4	0.9	0.2	1440

Adopted traffic growth rates as per traffic analysis is Presented in **Table 11.12**.

Table 11.12 : Traffic growth Rate of Motorized Traffic assigned on Project road (MT) (%)

Year	2014	2019	2024	2029	2034	2039
2 Wheeler	9.3	8.4	7.6	6.7	5.9	5.0
Passenger car	12.9	12.0	11.1	10.3	9.4	8.6
Pvt. Bus	4.4	4.2	4.0	3.8	3.5	3.3
LCV (4 Tyres)	16.1	15.1	14.0	13.0	12.0	10.9
2-Axle	16.1	15.1	14.0	13.0	12.0	10.9
3-Axle	16.1	15.1	14.0	13.0	12.0	10.9
Tata-ace	12.0	11.1	10.3	9.4	8.6	7.7
Multi Axle	16.1	15.1	14.0	13.0	12.0	10.9
LCV (6 Tyres)	16.1	15.1	14.0	13.0	12.0	10.9
Mini Bus	4.4	4.2	4.0	3.8	3.5	3.3

1.5 Economics Internal Rate of Return

Economic Analysis has been carried out for construction option discussed above. Variables considered in for economic analysis of the project are volatile and depend on various factors. In general, in case of economic analysis is also recommended that analysis period should not be long as it may lead to erroneous results.

However, in order to be able to draw the conclusions on common platform Economic Analysis have also been carried out for 14 years of analysis period. The summary of Economic internal rate of return (EIRR) worked out, for construction option based on life cycle cost analysis is presented below.

Economic Analysis was carried out following the methodology and input data discussed in the preceding paragraphs of this chapter using HDM-4 software.

The EIRR and NPV at 12% discount rate for each construction package as worked out with and without benefits due to travel time savings are summarized as under:

Table 11.13 : Results of Economic Analysis

Homogeneous Sections	Option	Undiscounted Net Economic Benefit (NPV)	Economic Internal Rate of Return
Bagramore-Panki	With time saving	13672.18	13.2

1.6 Sensitivity Analysis

The Sensitivity analysis has been carried out in order to study the viability of the project against the uncertainties in traffic forecasting and the possible variations of project cost due to unforeseen reasons. The sensitivity analysis has been performed with following situations.

S1: Base cost plus 15% and Base Benefits
S2: Base cost and Base Benefits minus 15%
S3: Base cost plus 15% and Base Benefits minus 15%

The sensitivity case S2 and S3 is not considered for economic analysis as major diverted

traffic does not exist on project road, majority of traffic includes inter village traffic that exists on the project road. This traffic will not diminish drastically and hence, ruled out.

The end results of this study have been summarised below:

Table 11.14 : Results of Sensitivity Analysis

Option	Economic Internal Rate of Return (%)		
	S1	S2	S3
With time saving	12.4	-	-

1.7 Conclusion

The project road is economically viable for proposed improvement as it yields more than 12% return (assumed interest rate for the analysis).